PATENT ABSTRACTS OF JAPAN

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(71)Applicant : UCHIHASHI ESTEC CO LTD
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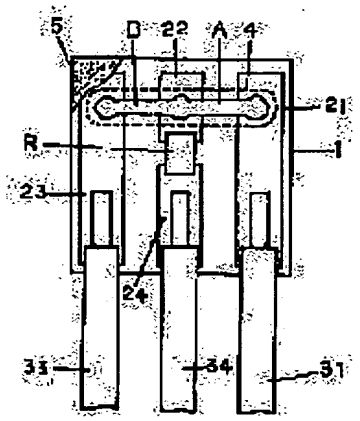
(54) PROTECTIVE ELEMENT AND ITS APPLICATION METHOD

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a highly functional protective element having a simple structure as well as allowing easy manufacture, and a method for using the element, regarding a protective element for fusing a low-fusion point fusible alloy piece via the detection of the overvoltage of equipment, and the subsequent feed of power to a film resistor for heat generation as well as the isolation of the equipment and the film resistor from a power supply.
SOLUTION: The first electrode 21, the second electrode 22, the third electrode 23 and the fourth electrode 24 are arranged on one side of an insulating board 1. In addition, a resistor R is provided across the second electrode 22 and the fourth electrode 24. Also, low-fusion point fusible alloy pieces A and B are respectively laid between the first electrode 21 and the second electrode 22, and between the second electrode 22 and the third electrode 23. Furthermore, flux 4 is applied to the low-fusion point fusible alloy pieces A and B, and one side of the insulating board 1 is covered with an insulation layer 5.



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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The 1st electrode, the 2nd electrode, the 3rd electrode, and the 4th electrode are prepared on one side of an insulating substrate. Prepare resistance over the 2nd electrode and the 4th electrode, and the pieces A and B of a low-melt point point fusible alloy are connected, respectively between the 1st electrode and the 2nd electrode and between the 2nd electrode and the 3rd electrode. The protection component characterized by applying flux to the piece of a low-melt point point fusible alloy, covering one side of the above-mentioned insulating substrate, covering an insulating layer and changing.
[Claim 2] Operation of the protection component characterized by connecting claim 1 thru/or the overvoltage sensing energization circuit which the 1st electrode of the protection component of a publication is connected to a power-source side, the 3rd electrode is connected [circuit] to a protected device side 3 either, respectively, and the overvoltage of a protected device is detected [circuit] between the 1st electrode or the 3rd electrode, and the 4th electrode, and carries out energization generation of heat of the above-mentioned resistance.
[Claim 3] It differs in the melting point of the piece A of a low-melt point point fusible alloy of a protection component according to claim 1, and the melting point of the piece B of a low-melt point point fusible alloy. Each piece of a low-melt point point fusible alloy is used as a fuse to a different circuit part. Detect a different overvoltage and the overvoltage sensing energization circuit which carries out energization generation of heat of the resistance of a protection component at different temperature is connected. smallness -- energization generation of heat of the resistance is carried out with an overvoltage -- making -- fusing of one piece of a low-melt point point fusible alloy -- one circuit part -- from a power source -- intercepting -- after that -- size -- the operation of the protection component characterized by carrying out energization generation of heat of the resistance with an overvoltage, and intercepting the circuit part of another side from a power source by fusing of the piece of a low-melt point point fusible alloy of another side.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the protection component used in order to protect an electrical machinery and apparatus from an overvoltage, and its operation.
[0002]
[Description of the Prior Art] When an overvoltage acts on a device and it intercepts a device from a power source, as membrane resistance and the piece of a low-melt point point fusible alloy are installed on one side of an insulating substrate, the protection component which covers one side of an insulating substrate with an insulating layer, and changes is used and it is shown in drawing 4 This protection component E' and overvoltage sensing energization circuit F', for example, circuit F' which connects zener diode D' and grows into the base side of transistor Tr', are inserted between power-source S' and protected device Z'. If the reverse voltage more than the breakdown voltage of zener diode D' acts on device Z', it is well-known to intercept device Z' from power-source S' by base current flowing, collector current flowing according to this base current, membrane resistance R' generating heat, and piece of low-melt point point fusible alloy A' being melted.
[0003] However, even if device Z' is intercepted from a power source by fusing of piece of low-melt point point fusible alloy A', when device Z' is a KYAPASHITIBU load (for example, when it is a battery), for residual voltage, base current continues flowing, energization generation of heat of membrane resistance R' may be continued, and it is dangerous with the above-mentioned protection component.
[0004] Then, composite electrode 20' which combined central fuse electrode 21' and heater one side T typeface electrode 22' as shown in (b) of drawing 5 , As printing formation of side T typeface electrode 23' besides a heater and HI-ZU both-sides electrode 24', and 25' is carried out at substrate 1' and it is shown in (b) of drawing 5 It crosses among T typeface both the arms of heater one side T typeface electrode 22', and side T typeface electrode 23' besides a heater., respectively Membrane resistance R', As prepare R', insulating-layer i' and i' are prepared on each membrane resistance, piece of low-melt point point fusible alloy A' and A' are connected between 25', respectively in central fuse electrode 21of composite electrode 20", and fuse both-sides electrode 24' and it is further shown to (Ha) of drawing 5 Using the protection component which covers flux layer 4' and external insulating-layer 5', and changes is proposed (JP,7-153367,A). as the protection network incorporating this protection component showing to drawing 6 -- membrane resistance R' -- it has 2 sets of pairs of piece of - low-melt point point fusible alloy A', and that piece of low-melt point point fusible alloy A' of a pair of is melted by energization generation of heat of membrane resistance R' of each set. **(ing) -- device Z', if the reverse voltage more than the breakdown voltage of zener diode D' acts on a side Base current flows to transistor Tr' and collector current flows. Both membrane resistance R', Energization generation of heat of R' is carried out, and while each piece of low-melt point point fusible alloy A' and A' are melted by energization generation of heat of each membrane resistance R' and R' and device Z' is intercepted from power-source S', membrane resistance R' and R' are intercepted from power-source S'.
[0005]
[Problem(s) to be Solved by the Invention] However, since the pair of the piece of a membrane resistance-low-melt point point fusible alloy is 2 sets, the resistance adjustment about two membrane resistance is required of the above-mentioned protection component, manufacture is troublesome, and since it is necessary to prepare superficially 2 sets of pieces of a membrane resistance-low-melt point point fusible alloy, it is disadvantageous also for the formation of small size of a protection component. Furthermore, the insulating layer on membrane

resistance, for example, glass membrane, is formed of screen-stencil, and it is hard to avoid it in irregularity-ization resulting from the mesh of a screen, and it cannot guarantee the balling-up fragmentation with the piece of a low-melt point point fusible alloy smooth in this basis on it easily.

[0006] The purpose of this invention detects the overvoltage of a device, carries out energization generation of heat of the membrane resistance, and makes the piece of a low-melt point point fusible alloy melt, for the protection component which intercepts a device and membrane resistance from a power source, it is easy structure and it is to offer the protection component excellent in actuation nature with easy manufacture, and the operation of the protection component.

[0007]

[Means for Solving the Problem] The protection component concerning this invention on one side of an insulating substrate The 1st electrode, the 2nd electrode, Prepare the 3rd electrode and the 4th electrode and resistance is prepared over the 2nd electrode and the 4th electrode. It is the configuration which connects the pieces A and B of a low-melt point point fusible alloy, respectively between the 1st electrode and the 2nd electrode and between the 2nd electrode and the 3rd electrode, applies flux to the piece of a low-melt point point fusible alloy, covers one side of the above-mentioned insulating substrate, covers an insulating layer, and changes. The 1st electrode is connected to a power-source side, and it connects the 3rd electrode to a protected device side, respectively, and the protection component concerning this invention detects the overvoltage of a protected device between the 1st electrode or the 3rd electrode, and the 4th electrode, and can connect and use for it the overvoltage sensing energization circuit which carries out energization generation of heat of the above-mentioned resistance.

[0008] Moreover, the protection component concerning this invention differs in the melting point of the piece A of a low-melt point point fusible alloy, and the melting point of the piece B of a low-melt point point fusible alloy. Each piece of a low-melt point point fusible alloy is used as a fuse to a different circuit part. Detect a different overvoltage and the overvoltage sensing energization circuit which carries out energization generation of heat of the resistance of a protection component at different temperature is connected. smallness -- energization generation of heat of the resistance is carried out with an overvoltage -- making -- fusing of one piece of a low-melt point point fusible alloy -- one circuit part -- from a power source -- intercepting -- after that -- size -- it can be used also by carrying out energization generation of heat of the resistance with an overvoltage, and intercepting the circuit part of another side from a power source by fusing of the piece of a low-melt point point fusible alloy of another side.

[0009]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained, referring to a drawing. Drawing 1 shows an example of the protection component concerning this invention. 1 is in drawing 1 , heat-resistant insulating substrate, for example, ceramic plate. On one side of an insulating substrate, 21-24 are the 1st electrode of the shape of film which carried out printing formation - the 4th electrode, form the 2nd electrode 22 between the point of the 1st electrode 21, and the point of the 3rd electrode 23, and have separated and prepared [spacing / the 2nd electrode 22 and / predetermined] it in the 4th electrode 24 further. 31, 33, and 34 are the lead wire (pre-insulation line) linked to each of the 1st electrode, the 3rd electrode, and the 4th electrode. R is the membrane resistance prepared by printing over the 2nd electrode 22 and the 4th electrode 24. It is the piece of a low-melt point point fusible alloy which connected A between the point of the 1st electrode 21, and the 2nd electrode 22, and the piece of a low-melt point point fusible alloy which connected B between the points of the 2nd electrode 22 and the 3rd electrode 23, and when the pieces A and B of a low-melt point point fusible alloy are the same quality of the material and the same configuration, as shown in drawing, you may make it a successive line. 4 is the flux applied on the pieces A and B of a low-melt point point fusible alloy. 5 has used the insulating material which can be covered with ordinary temperature, for example, a room-temperature-setting epoxy resin, so that it may be the insulating layer which prepared it as covered one side of an insulating substrate 1 and a melting flow of the above-mentioned piece of a low-melt point point fusible alloy or the flux may not be carried out.

[0010] It is used in order, as for the protection component concerning this invention, to intercept the device from a power source, if an overvoltage acts on a protected device, and drawing 2 is a circuit diagram for explaining the busy condition, and, as for F, the overvoltage sensing energization circuit is shown for the protection component which E requires for this invention, respectively. In drawing 2 , the protection component

E and the overvoltage sensing energization circuit F which start this invention between the protected device Z and a power source S are incorporated. The collector of Transistor Tr is connected to the 4th electrode 24 of the protection component E. The high-voltage lateral electrode of zener diode D and the 3rd electrode 23 of the protection component E are connected to the high-voltage side edge child of the protected device Z, the 1st electrode 21 of the protection component E is connected to the high-voltage side edge child of a power source S, and the emitter of Transistor Tr is grounded. In the circuit shown in drawing 2 , if the overvoltage more than the breakdown voltage of zener diode D acts on Device Z Base current flows to Transistor Tr, the collector current which becomes size in connection with this flows, and membrane resistance R generates heat. It is melted this generating heat being transmitted to the pieces A and B of a low-melt point point fusible alloy through the 2nd electrode 22, and the pieces A and B of both the low-melt point point fusible alloy receiving an activity operation of existing fused flux, and while the protected device Z is intercepted from a power source S, membrane resistance R is intercepted from a power source S. Therefore, after the piece B of a low-melt point point fusible alloy is melted, even if the overvoltage condition of Device Z is maintained for residual charge and Transistor Tr is in switch-on, exoergic continuation of membrane resistance R can be eliminated for the cutoff from the power source S of the membrane resistance R by fusing of the piece A of a low-melt point point fusible alloy. In the above, the high-voltage lateral electrode of zener diode D may be connected to the 1st electrode 21 side.

[0011] In the above, it contributes effectively to fusing of a melting low-melt point point metal that an insulating substrate crawls molten metal and that an electrode is well damp in molten metal, and the surface smooth nature of an insulating substrate is also important conditions (element which make it easy to flow molten metal). The ceramic plate is excellent in surface smooth nature compared with the screen-stencil film of glass, and advantageous for ****. In the protection component concerning this invention, as shown in drawing 3 , use the piece B of a low-melt point point fusible alloy as a fuse to the circuit part Zb, use the piece A of a low-melt point point fusible alloy as a fuse to the circuit part Za, and it sets to drawing 3 . Breakdown voltage Vb of zener diode Db is made lower than the breakdown voltage Va of zener diode Da. The melting point of the piece B of a low-melt point point fusible alloy is made lower than the melting point of the piece A of a low-melt point point fusible alloy. It is made to flow through zener diode Db in the overvoltage of Vb-Va. Base current A sink, If carry out energization generation of heat of the resistance R of the protection component E by the collector current corresponding to this **-SU current, the piece B of a low-melt point point fusible alloy is made to melt, the circuit part Zb is intercepted from a power source (second-s' is a power supply terminal) and the overvoltage more than Va acts after that It is made to flow through NADAIO-DO Da, energization generation of heat of the resistance R of the protection component E can be carried out by the collector current corresponding to a sink and this **-SU current for base current, the piece A of a low-melt point point fusible alloy can be made to be able to melt, and the circuit part Za can also be made to intercept from a power source (for second-s' to be a power supply terminal).

[0012] In the protection component concerning this invention, a ceramic plate with a thickness of 100-1200 micrometers, for example, 96% alumina-ceramics plate, can be used for an insulating substrate. In addition, a metal is used as a parent, and use is also possible although insulating processing was carried out. Usually (3mm - 20mm) let the flat-surface dimension of an insulating substrate be the square or rectangle of x (3mm - 20mm). the protection component concerning this invention -- it is and the low-melting-alloys wire whose liquidus-line temperature is 75 degrees C - 300 degree-C diameter of 100 micrometers - 1200 micrometers, the low-melting alloy square wire of the same cross section as this, or a low-melting-alloys foil can be used for the piece of a low-melt point point fusible alloy. the protection component concerning this invention -- it is, and an electrode screen-stencils conductive paste (conductor being the mixture of powder and a cover coat a conductor powder a silver-platinum system, a silver-palladium system, a copper system), and can form it by the ability burning this. Moreover, an insulating substrate with an electrode can also be obtained by etching of the copper foil of a copper foil laminated circuit board. the protection component concerning this invention -- it is, membrane resistance screen-stencils the mixture of resistive paste, for example, ruthenium oxide powder, or carbon powder, and a cover coat on an insulating substrate, it can form by the ability burning this, and thickness is usually set to 1-30 micrometers. The membrane resistance of a Ti-Si system can also be used for membrane resistance. Trimming can also be performed, after forming a glass protective coat on membrane resistance so that a crack may not occur in membrane resistance in this case although trimming performed when you needed

resistance adjustment of membrane resistance. Furthermore, for long term stability etc., when protection is required, a protective coat, for example, glass membrane, is formed on membrane resistance. The lap condition of a membrane resistance edge and an electrode edge is good also considering any as the bottom. It replaces with such membrane resistance and use of a chip resistor is also possible.

[0013] In the protection component concerning this invention, flux prevents oxidation of the piece of a low-melt point point fusible alloy, and it is used in order to dissolve some oxide films of the piece of a low-melt point point fusible alloy and to make fragmentation of a melting alloy easy, it usually uses rosin as a principal component, and can use what added the activator (for example, hydrochloride of diethylamine) if needed.

[0014] In order to manufacture the protection component concerning this invention, the 1st electrode - the 4th electrode are formed in one side of an insulating substrate. Membrane resistance is printed, a glass protective coat is formed on membrane resistance, and trimming adjusts resistance if needed. When resistance protection is required Glass membrane is formed on membrane resistance, the pieces A and B of a low-melt point point fusible alloy are connected, lead wire is connected to an electrode, flux is applied to the piece of a low-melt point point fusible alloy, subsequently to the epoxy resin liquid of ordinary temperature a substrate is immersed, and the approach of carrying out desiccation hardening of the dipcoat layer can be used.

[0015]

[Effect of the Invention] In the protection component concerning this invention, it has the resistor of a piece, and two pieces of a low-melt point point fusible alloy. When an overvoltage acts on a protected device, while making both pieces of a low-melt point point fusible alloy melt by energization generation of heat of a resistor and intercepting a protected device from a power source, a resistor can be intercepted from a power source. Compared with the configuration which prepares a resistor to each of the conventional example, i.e., the piece of both the low-melt point point fusible alloy, melts one piece of a low-melt point point fusible alloy by energization generation of heat of one resistor, and melts the piece of a low-melt point point fusible alloy of another side by energization generation of heat of the resistor of another side, it is structurally simple.

[0016] Moreover, prepare insulating glass membrane on membrane resistance, and it differs from the conventional example which has allotted the piece of a low-melt point point fusible alloy in piles on this insulating glass membrane. It allots without piling up membrane resistance and the piece of a low-melt point point fusible alloy, and is the front face (on screen-stencil) of the above-mentioned insulating glass membrane. Since the irregularity resulting from a screen mesh was avoided, and twisted and the twist has also allotted the piece of a low-melt point point fusible alloy on the ceramic insulating substrate on the front face of smooth, a melting alloy is made to flow smoothly, it makes divide quickly and obtains, and the outstanding actuation nature can be guaranteed. Furthermore, when you need resistance adjustment, since what is necessary is just to perform resistance adjustment by trimming about the membrane resistance of a piece, a manufacture man day can be reduced and it is advantageous on manufacture. Furthermore, a different circuit part can also be intercepted from a power source to a different overvoltage again.

[Translation done.]

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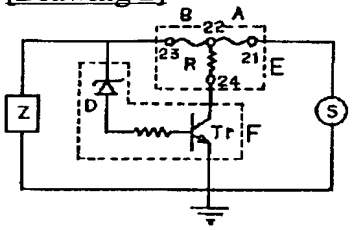
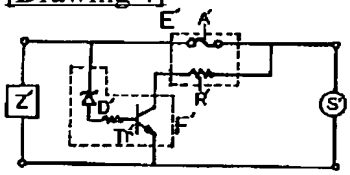
DRAWINGS

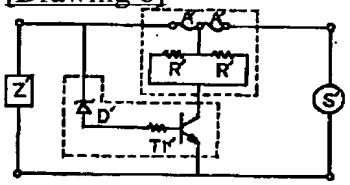
[Drawing 2]



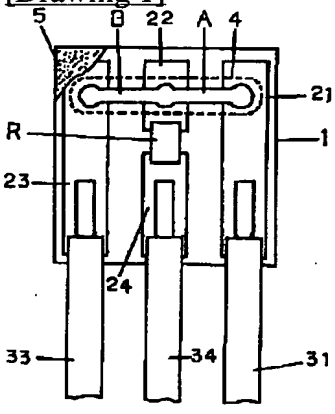
[Drawing 4]



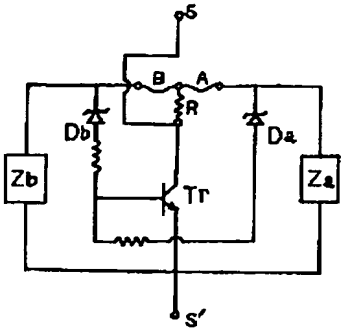
[Drawing 6]



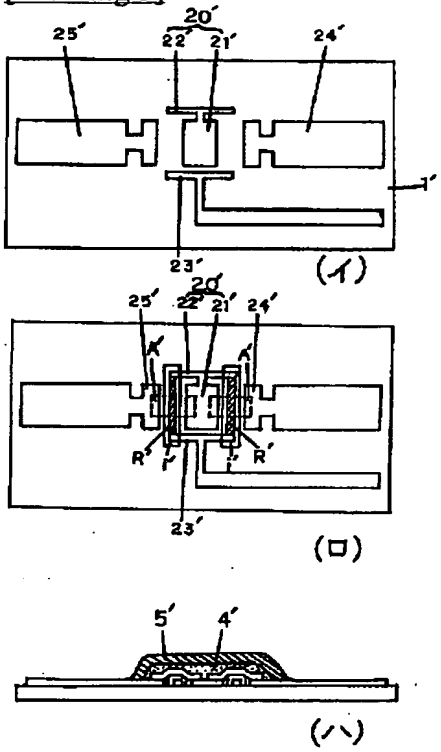
[Drawing 1]



[Drawing 3]



[Drawing 5]



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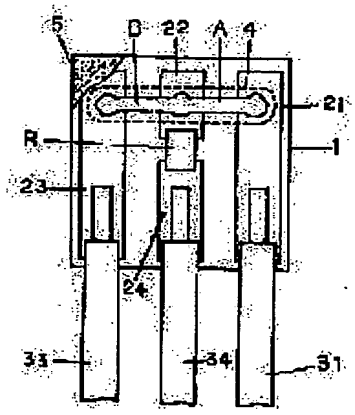

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85/00		85/00	Ｈ
85/46		85/46	

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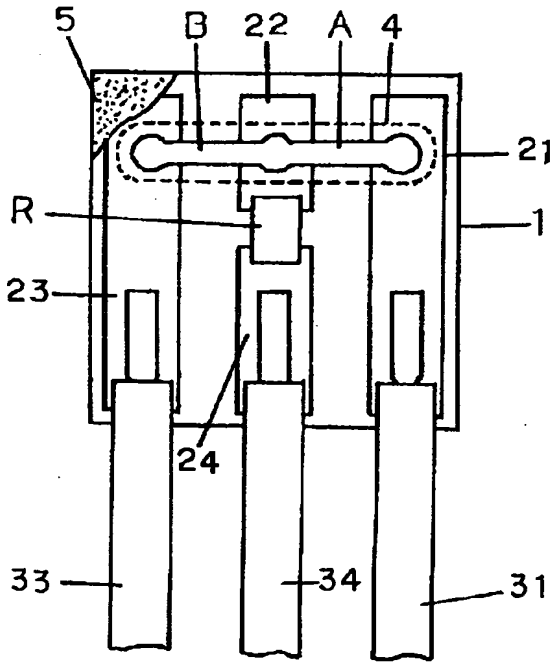
(54)【発明の名称】　保護素子及びその使用方法

(57)【要約】

【課題】機器の過電圧を検知し膜抵抗を通電発熱させて低融点可溶合金片を溶断させ、機器及び膜抵抗を電源より遮断する保護素子を対象とし、構造が簡単で製造が容易な作動性に優れた保護素子及びその保護素子の使用方法を提供する。

【解決手段】絶縁基板１の片面上に第１電極２１、第２電極２２、第３電極２３及び第４電極２４を設け、第２電極２２と第４電極２４とにわたって抵抗Ｒを設け、第１電極２１と第２電極２２との間及び第２電極２２と第３電極２３との間に低融点可溶合金片Ａ及びＢをそれぞれ接続し、低融点可溶合金片にフラックス４を塗布し、上記絶縁基板の片面を覆って絶縁層５を被覆して成る。



【特許請求の範囲】
【請求項１】絶縁基板の片面上に第１電極、第２電極、第３電極及び第４電極を設け、第２電極と第４電極とにわたって抵抗を設け、第１電極と第２電極との間及び第２電極と第３電極との間に低融点可溶合金片Ａ及びＢをそれぞれ接続し、低融点可溶合金片にフラックスを塗布し、上記絶縁基板の片面を覆って絶縁層を被覆して成ることを特徴とする保護素子。
【請求項２】請求項１乃至３何れか記載の保護素子の第１電極を電源側に、第３電極を被保護機器側にそれぞれ接続し、第１電極または第３電極と第４電極との間に被保護機器の過電圧を検知し、上記抵抗を通電発熱させる過電圧検知通電回路を接続することを特徴とする保護素子の使用方法。
【請求項３】請求項１記載の保護素子の低融点可溶合金片Ａの融点と低融点可溶合金片Ｂの融点とを異にし、各低融点可溶合金片を異なる回路部分に対するヒューズとして用い、異なる過電圧を検出して保護素子の抵抗を異なる温度で通電発熱させる過電圧検知通電回路を接続し、小なる過電圧で抵抗を通電発熱させて一方の低融点可溶合金片の溶断で一方の回路部分を電源から遮断し、その後の大なる過電圧で抵抗を通電発熱させて他方の低融点可溶合金片の溶断で他方の回路部分を電源から遮断することを特徴とする保護素子の使用方法。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は過電圧から電気機器を保護するために用いる保護素子及びその使用方法に関するものである。
【０００２】
【従来の技術】機器に過電圧が作用したときに機器を電源から遮断する場合、膜抵抗と低融点可溶合金片とを絶縁基板の片面上に並設し、絶縁基板の片面を絶縁層で被覆して成る保護素子を使用し、図４に示すように、この保護素子Ｅ’及び過電圧検知通電回路Ｆ’、例えば、トランジスタＴｒ’のベース側にツエナダイオードＤ’を接続して成る回路Ｆ’を電源Ｓ’と被保護機器Ｚ’との間に挿入し、機器Ｚ’にツエナダイオードＤ’の降伏電圧以上の逆電圧が作用すると、ベース電流が流れ、このベース電流に応じコレクタ電流が流れて膜抵抗Ｒ’が発熱し、低融点可溶合金片Ａ’が溶断されることで機器Ｚ’を電源Ｓ’から遮断することが公知である。
【０００３】しかしながら、上記の保護素子では、低融点可溶合金片Ａ’の溶断で機器Ｚ’が電源から遮断されても、機器Ｚ’がキャパシティブな負荷の場合、例えば蓄電池の場合、残留電圧のためにベース電流が流れ続けて膜抵抗Ｒ’の通電発熱が継続されることがあり、危険である。
【０００４】そこで、図５の（イ）に示すように、中央ヒューズ電極２１’とヒーター片側Ｔ字形電極２２’とを結合した複合電極２０’、ヒーター他側Ｔ字形電極２３’及びヒーズ両側電極２４’、２５’とを基板１’に印刷形成し、図５の（ロ）に示すように、ヒーター片側Ｔ字形電極２２’とヒーター他側Ｔ字形電極２３’とのＴ字形両アーム間にわたってそれぞれ膜抵抗Ｒ’、Ｒ’を設け、各膜抵抗上に絶縁層ｉ’、ｉ’を設け、複合電極２０’の中央ヒューズ電極２１’とヒューズ両側電極２４’ね２５’との間にそれぞれ低融点可溶合金片Ａ’、Ａ’を接続し、更に図５の（ハ）に示すように、フラックス層４’及び外部絶縁層５’を被覆して成る保護素子を用いることが提案されている（特開平７－１５３３６７号）。この保護素子を組み込んだ保護回路では、図６に示す通り膜抵抗Ｒ’ー低融点可溶合金片Ａ’の対を２組備え、各対の膜抵抗Ｒ’の通電発熱でその対の低融点可溶合金片Ａ’を溶断している。而して、機器Ｚ’側にツエナダイオードＤ’の降伏電圧以上の逆電圧が作用すると、トランジスタＴｒ’にベース電流が流れ、コレクタ電流が流れて両膜抵抗Ｒ’、Ｒ’が通電発熱され、各膜抵抗Ｒ’、Ｒ’の通電発熱で各低融点可溶合金片Ａ’、Ａ’が溶断されて機器Ｚ’が電源Ｓ’から遮断されると共に膜抵抗Ｒ’、Ｒ’が電源Ｓ’から遮断される。
【０００５】
【発明が解決しようとする課題】しかしながら、上記の保護素子では膜抵抗ー低融点可溶合金片の対が二組であるために２個の膜抵抗についての抵抗値調整が必要であって製造がやっかいであり、また、膜抵抗ー低融点可溶合金片を平面的に２組設ける必要があるため保護素子の小サイズ化にも不利である。更に、膜抵抗上の絶縁層、例えばガラス膜はスクリーン印刷により形成され、スクリーンのメッシユに起因しての凹凸化か避け難く、かかるもとでは、その上での低融点可溶合金片の円滑な球状化分断を保証し難い。
【０００６】本発明の目的は、機器の過電圧を検知し膜抵抗を通電発熱させて低融点可溶合金片を溶断させ、機器及び膜抵抗を電源より遮断する保護素子を対象とし、構造が簡単で製造が容易な作動性に優れた保護素子及びその保護素子の使用方法を提供することにある。
【０００７】
【課題を解決しようとする手段】本発明に係る保護素子は、絶縁基板の片面上に第１電極、第２電極、第３電極及び第４電極を設け、第２電極と第４電極とにわたって抵抗を設け、第１電極と第２電極との間及び第２電極と第３電極との間に低融点可溶合金片Ａ及びＢをそれぞれ接続し、低融点可溶合金片にフラックスを塗布し、上記絶縁基板の片面を覆って絶縁層を被覆して成る構成である。本発明に係る保護素子は、第１電極を電源側に、第３電極を被保護機器側にそれぞれ接続し、第１電極または第３電極と第４電極との間に被保護機器の過電圧を検知し、上記抵抗を通電発熱させる過電圧検知通電回路を

接続して使用できる。

【０００８】また、本発明に係る保護素子は、低融点可溶合金片Ａの融点と低融点可溶合金片Ｂの融点とを異にし、各低融点可溶合金片を異なる回路部分に対するヒューズとして用い、異なる過電圧を検出して保護素子の抵抗を異なる温度で通電発熱させる過電圧検知通電回路を接続し、小なる過電圧で抵抗を通電発熱させて一方の低融点可溶合金片の溶断で一方の回路部分を電源から遮断し、その後の大なる過電圧で抵抗を通電発熱させて他方の低融点可溶合金片の溶断で他方の回路部分を電源から遮断することによっても使用できる。

【０００９】

【発明の実施の形態】以下、図面を参照しつつ本発明の実施の形態について説明する。図１は本発明に係る保護素子の一例を示している。図１において、１は耐熱性の絶縁基板、例えばセラミックス板である。２１～２４は絶縁基板の片面上に印刷形成した膜状の第１電極～第４電極であり、第１電極２１の先端部と第３電極２３の先端部との間に第２電極２２を設け、更に第４電極２４を第２電極２２と所定の間隔を隔てて設けてある。３１、３３及び３４は第１電極、第３電極及び第４電極のそれぞれに接続したリード線（絶縁被覆線）である。Ｒは第２電極２２と第４電極２４とにわたって印刷により設けた膜抵抗である。Ａは第１電極２１の先端部と第２電極２２との間に接続した低融点可溶合金片、Ｂは第２電極２２と第３電極２３の先端部との間に接続した低融点可溶合金片であり、低融点可溶合金片Ａ、Ｂが同一材質、同一形状の場合、図のように連続線にしてもよい。４は低融点可溶合金片Ａ及びＢ上に塗布したフラックスである。５は絶縁基板１の片面を覆うようにして設けた絶縁層であり、上記低融点可溶合金片やフラックスを溶融流動させることのないように、常温で被覆できる絶縁材、例えば常温硬化エポキシ樹脂を使用してある。

【００１０】本発明に係る保護素子は、被保護機器に過電圧が作用すると、その機器を電源から遮断するために使用され、図２はその使用状態を説明するための回路図であり、Ｅは本発明に係る保護素子を、Ｆは過電圧検知通電回路をそれぞれ示している。図２において、被保護機器Ｚと電源Ｓとの間に本発明に係る保護素子Ｅと過電圧検知通電回路Ｆとを組み込み、トランジスタＴｒのコレクタを保護素子Ｅの第４電極２４に接続し、ツエナダイオードＤの高電圧側電極及び保護素子Ｅの第３電極２３を被保護機器Ｚの高電圧側端子に接続し、保護素子Ｅの第１電極２１を電源Ｓの高電圧側端子に接続し、トランジスタＴｒのエミッタを接地してある。図２に示す回路において、機器Ｚにツエナダイオードの降伏電圧以上の過電圧が作用すると、トランジスタＴｒにベース電流が流れ、これに伴い大なるコレクタ電流が流れて膜抵抗Ｒが発熱され、この発生熱が第２電極２２を介し低融点可溶合金片Ａ及びＢに伝達されて両低融点可溶合金片Ａ及びＢが既溶融フラックスの活性作用を受けつつ溶断され、被保護機器Ｚが電源Ｓから遮断されると共に膜抵抗Ｒが電源Ｓから遮断される。従って、低融点可溶合金片Ｂが溶断されたのち、機器Ｚの過電圧状態が残留電荷のために維持されてトランジスタＴｒが導通状態にあっても、低融点可溶合金片Ａの溶断による膜抵抗Ｒの電源Ｓからの遮断のために、膜抵抗Ｒの発熱続行を排除できる。上記において、ツエナダイオードＤの高電圧側電極を第１電極２１側に接続してもよい。

【００１１】上記において、溶融低融点金属の溶断には、絶縁基板が溶融金属をはじくことと、電極が溶融金属によく濡れることが有効に寄与し、絶縁基板の表面平滑性も重要な条件である（溶融金属を流れ易くする要素）。而るに、セラミックス板は、ガラスのスクリーン印刷膜に較べ表面平滑性に優れており有利である。本発明に係る保護素子においては、図３に示すように、低融点可溶合金片Ｂを回路部分Ｚｂに対するヒューズとして用い、低融点可溶合金片Ａを回路部分Ｚａに対するヒューズとして用い、図３において、ツエナダイオードＤｂの降伏電圧Ｖｂをツエナダイオードの降伏電圧Ｖａよりも低くし、低融点可溶合金片Ｂの融点を低融点可溶合金片Ａの融点よりも低くし、Ｖｂ～Ｖａの過電圧でツエナダイオードＤｂを導通させてベース電流を流し、このベース電流に対応するコレクタ電流で保護素子Ｅの抵抗Ｒを通電発熱させ低融点可溶合金片Ｂを溶断させて回路部分Ｚｂを電源（ｓ－ｓ’は電源端子）から遮断し、その後、Ｖａ以上の過電圧が作用すると、ナダイオードＤａを導通させてベース電流を流し、このベース電流に対応するコレクタ電流で保護素子Ｅの抵抗Ｒを通電発熱させ低融点可溶合金片Ａを溶断させて回路部分Ｚａを電源（ｓ－ｓ’は電源端子）から遮断させることもできる。

【００１２】本発明に係る保護素子において、絶縁基板には厚み１００～１２００μｍのセラミックス板、例えば、９６％アルミナセラミックス板を使用できる。その他、金属を母体とし、絶縁処理したものの使用も可能である。絶縁基板の平面寸法は、通常（３ｍｍ～２０ｍｍ）×（３ｍｍ～２０ｍｍ）の正方形乃至は長方形とされる。本発明に係る保護素子おいて、低融点可溶合金片には液相線温度が７５℃～３００℃直径１００μｍ～１２００μｍの低融点合金丸線、これと同一断面積の低融点合金角線または低融点合金箔を使用できる。本発明に係る保護素子おいて、電極は導体ペースト（導体粉末と釉薬との混合物であり、導体粉末には銀ー白金系、銀ーパラジウム系、銅系）をスクリーン印刷し、これを焼き付けることにより形成できる。また、銅箔積層基板の銅箔のエッチングにより電極付き絶縁基板を得ることもできる。本発明に係る保護素子おいて、膜抵抗は抵抗ペースト、例えば、酸化ルテニウム粉末または炭素粉末と釉薬との混合物を絶縁基板上にスクリーン印刷し、これを

焼き付けることにより形成でき、膜厚は通常１～３０μｍとされる。膜抵抗にはＴｉ－Ｓｉ系の膜抵抗を使用することもできる。膜抵抗の抵抗値調整を必要とする場合、トリミングにより行うが、この際膜抵抗に亀裂が発生することのないように、膜抵抗上にガラス保護膜を形成したうえで、トリミングを行うこともできる。更に、長期安定性等のために保護が必要な場合は、膜抵抗上に保護膜、例えば、ガラス膜を形成する。膜抵抗端部と電極端部との重なり状態は、何れを下側としてもよい。これらの膜抵抗に代え、チップ抵抗の使用も可能である。

【００１３】本発明に係る保護素子において、フラックスは低融点可溶合金片の酸化を防止し、かつ低融点可溶合金片の多少の酸化膜を溶解して溶融合金の分断を容易にするために用いられ、通常ロジンを主成分とし、必要に応じて活性剤（例えば、ジエチルアミンの塩酸塩）を添加したものを使用できる。

【００１４】本発明に係る保護素子を製造するには、絶縁基板の片面に第１電極～第４電極を形成し、膜抵抗を印刷し、膜抵抗上にガラス保護膜を形成し、必要に応じトリミングにより抵抗値を調整し、抵抗保護が必要な場合は、膜抵抗上にガラス膜を形成し、低融点可溶合金片Ａ及びＢを接続し、電極にリード線を接続し、低融点可溶合金片にフラックスを塗布し、次いで基板を常温のエポキシ樹脂液に浸漬し、その浸漬被覆層を乾燥硬化させる方法を使用できる。

【００１５】

【発明の効果】本発明に係る保護素子においては、一個の抵抗体と二個の低融点可溶合金片を有し、被保護機器に過電圧が作用したときに抵抗体の通電発熱により両方の低融点可溶合金片を溶断させて被保護機器を電源から遮断すると共に抵抗体を電源から遮断することができ、従来例、すなわち、両低融点可溶合金片のそれぞれに対し抵抗体を設け、一方の抵抗体の通電発熱で一方の低融点可溶合金片を溶断し、他方の抵抗体の通電発熱で他方の低融点可溶合金片を溶断する構成に較べ、構造的に簡易である。

【００１６】また、膜抵抗上に絶縁ガラス膜を設け、この絶縁ガラス膜上に低融点可溶合金片を重ねて配している従来例とは異なり、膜抵抗と低融点可溶合金片とを重ねずに配し、上記絶縁ガラス膜の表面（スクリーン印刷上、スクリーンメッシュに起因する凹凸が避けられない）よりも平滑表面のセラミックス絶縁基板上に低融点可溶合金片を配しているから、溶融合金をスムーズに流動させて迅速に分断させ得、優れた作動性を保証できる。更に、抵抗値調整を必要とする場合、トリミングによる抵抗値調整を一個の膜抵抗について行えばよいから、製造工数を低減でき、製造上有利である。更にまた、異なる回路部分を異なる過電圧に対し電源から遮断することもできる。

【図面の簡単な説明】

【図１】本発明に係る保護素子の一例を示す説明図である。

【図２】本発明に係る保護素子を用いた回路の一例を示す説明図である。

【図３】本発明に係る保護素子を用いた回路の一例を示す説明図である。

【図４】従来の保護回路を示す説明図である。

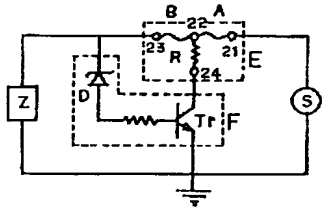
【図５】従来の保護素子を示す説明図である。

【図６】図５の保護素子を用いた保護回路を示す説明図である。

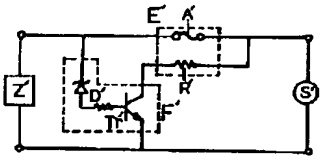
【符号の説明】

１	絶縁基板
２１	第１電極
２２	第２電極
２３	第３電極
２４	第４電極
Ａ	低融点可溶合金片
Ｂ	低融点可溶合金片
Ｒ	抵抗
４	フラックス
５	絶縁層
Ｅ	保護素子
Ｆ	過電圧検知通電回路
Ｚ	被保護機器
Ｓ	電源

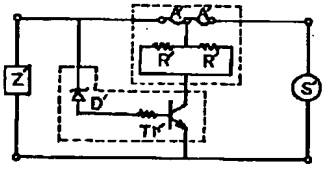
【図２】



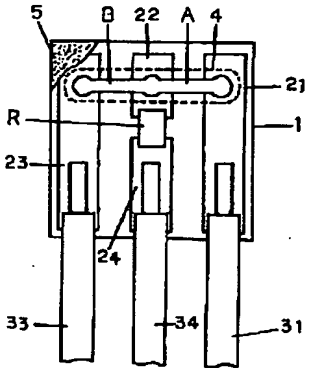
【図４】



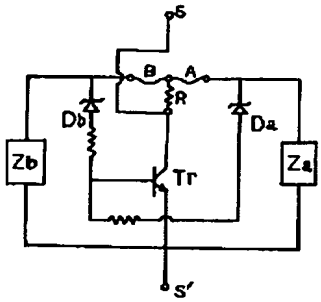
【図６】



【図１】



【図３】



【図５】